CSED 490C

LAB 6

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Q1

There are four global memory reads being performed by the kernels. Two reads are from `scan` kernel call. One is from `scan_add` kernel call. Last read is from writing back to host memory.

Q2

There are five global memory writes are being performed by the kernels. One is to copy the input from host to device. Two copies are from `scan` kernel call to write output. There is one copy to create the auxiliary input array. Last copy is from `scan_add` kernel call to write output.

Q3

A single thread block synchronizes $2 \cdot \log(n)$ times to reduce its portion of the array to a single value.

Q4

Yes, as long as the associativity of the binary operator holds. Parallel scan does not change the order of the binary operation. Therefore, the result should not change even though the binary operator is not commutative.

Q5

If the binary operator does not have associativity, it is possible to get the different results between the serial version and parallel version of the scan kernel. As parallel version keeps the temporary version of the result, the correct order of computation may not be observed, which can lead to an different result between the serial and parallel version.

Q7

Computation was run on cse-edu cluster with `srun -p titanxp -N 1 -n 6 --mem=32G --gres=gpu:2 --pty /bin/bash -l` command.

Lab6 GPU Computation times
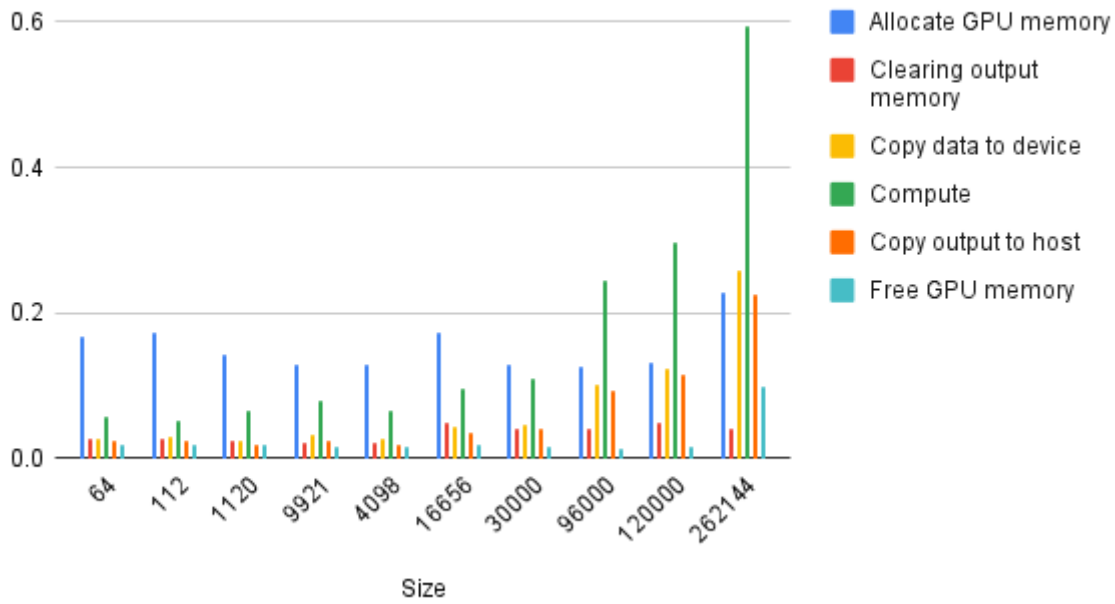
Size	Import data to host	Allocate GPU memory	Clearing output memory	Copy data to device	Compute	Copy output to host	Free GPU memory
64	0.465333	0.168594	0.027842	0.028051	0.056307	0.023963	0.019892
112	0.961088	0.173824	0.028366	0.02857	0.050512	0.023903	0.019806
1120	4.9488	0.141861	0.024812	0.025049	0.064424	0.01875	0.017355
9921	37.2342	0.128931	0.021751	0.031856	0.078189	0.024813	0.015359
4098	15.492	0.129943	0.021313	0.025839	0.06666	0.019558	0.015853
16656	90.7267	0.172094	0.048947	0.042547	0.094513	0.035255	0.019973
30000	115.511	0.128909	0.039437	0.045752	0.110386	0.041493	0.016569
96000	383	0.125953	0.040708	0.102128	0.244163	0.09438	0.014041
120000	493.241	0.131338	0.049725	0.123185	0.296202	0.114116	0.016124
262144	1093.57	0.227106	0.041595	0.258549	0.593499	0.224495	0.097628